

Inter-Sectoral Linkages in Manufacturing

A Study of Metal Engineering Industry in Kanpur, India

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P r e f a c e

The present study is prepared at the instance of the International Labour Organisation, Geneva, under their World Employment Programme Research. It is one of the 'country studies' undertaken as a part of the project on technological linkages between the formal and informal sectors of manufacturing activities; studies of agricultural machinery in People's Republic of China, auto-parts manufacturing in the Phillipines, textiles in Egypt and auto-repair in Ghana, being some of the others. The empirical situation in the case that we studied, viz., metal engineering industry in Kanpur, however, required a somewhat wider and different treatment of the subject. First, the phenomenon of technological linkages was found to exist to a smaller extent than, and invariably as an accompaniment of, market linkages; and, therefore, the question of market linkages had to be considered as the central element. Second, the structure of organisations did not permit a neat distinction between formal and informal sectors, which was partly due also to the nebulous character of the concepts themselves. We, therefore, resorted to a simpler and less imprecise distinction between large and small sectors, on the basis of size of employment. The study is, accordingly, designated as Inter-sectoral Linkages in Manufacturing, rather than Technological Linkages between Formal and Informal Sectors.

We are grateful to the International Labour Organisation for sponsoring and financing the study, which gave us an opportunity to look at an important aspect of the manufacturing sector, on which studies are still scarce in India. We hope that findings and conclusions of the study, however tentative they are, will provide hypotheses for further studies on this subject of great analytical and policy significance.

We have greatly benefited by the critical but helpful comments of and long discussions with Susumu Watanabe of the ILO. He shared with us the experience, and findings of his extensive work on the subject in varying empirical situations, which provided us with insights which we could have overlooked otherwise. Comments from Amiya Bagchi on an earlier draft obliged us to look for some of the 'under-the-surface' factors in the process of linkages between the large and small enterprises. Nevertheless, the study would still be found to have some loose ends, which could be tied up only by more studies on the subject.

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I. INTRODUCTION

Coexistence of small and unorganised sector along with the large and organised sector is a common phenomenon in most of the industries in India. Relatively rapid increase in the number of small enterprises, along with fast growth of the large scale organised sector, has been facilitated to a certain extent by the preferential policy of the Government in favour of the small sector. Whether the coexistence of the two sectors accelerates the growth of industry, strengthening both small and large sectors, simultaneously would, however, depend on the pattern of their mutual relationships. In industries characterised by significant economies of scale, the smaller enterprises would find it inevitably difficult to survive, if they choose to produce for the same market as the large enterprises. Besides, the larger enterprises are in a much better position to invest in research and development for technological improvements than the small enterprises. The large enterprises obviously would not share their know-how with the small enterprises, if they are in competitive lines.

Complementary rather than competitive pattern of coexistence of the two sectors is likely to bring about a greater integration in the industrial structure by facilitating inter-sectoral linkages in production. Such linkages would also tend to reduce technological dualism between the two sectors by encouraging technical cooperation. It may, however, be noted that while the overall interest of industrial development may require such a

pattern of cooperation and integration, it will not be practised if it does not help the individual entrepreneurs to fulfil their production objective, may that be profit maximisation, expansion or anything else. It is, therefore, interesting and worthwhile to study the relationship between the units in two sectors with a view to examining the extent, pattern, motivations and effect of such cooperation.

I.1. Objectives of the Study

The present study attempts to examine the above aspects in reference to the metal-engineering industry in Kanpur, India. Metal engineering industry is generally characterised by a process of production involving many stages each of which can be carried out independently in different premises. It, therefore, offers considerable opportunity for cooperation among several large and small enterprises for the manufacture of the final product. Being an industry requiring a certain degree of technological sophistication and experiencing rapid technological change it also requires greater integration of technology between small enterprises making parts and intermediate products and the large ones producing the final product.

The study has the following major objectives:

- (i) to assess the extent of technological and market interrelationships among the large and small enterprises;
- (ii) to identify the modes and patterns of inter-

sectoral linkages;

- (iii) to examine the factors motivating enterprises to enter into linkages;
- (iv) to assess the impact of linkages on growth and performance of enterprises;
- (v) to consider the possibility or otherwise of increasing inter-sectoral cooperation, particularly with a view to improving productivity in the small sector.

I.2. Concepts of Large and Small Sectors

For purposes of the present study all enterprises employing 10 workers or more using power or 20 workers or more without the use of power have been included in the category of 'large' enterprises; enterprises with smaller employment size constitute the 'small' sector. This distinction has been used primarily because the enterprises in the 'large' category are covered under the Factories Act 1948, which makes certain stipulations in respect of employment and conditions of work, while the 'small' enterprises are not subject to such regulations. This distinction may conform to the dichotomous classification of enterprises into formal and informal sectors to the extent the statutory regulation of employment conditions in the Factories and its absence in non-factory enterprises, makes a qualitative difference in the functioning of the two types of enterprises. However, in respect of technological and organisational characteristics of enterprises our distinction between 'large' and 'small' enterprises does not necessarily conform to the formal-informal sector dichotomy. Rather we get a continuum of the enterprise structures and

technology which could broadly be broken into the following four categories:

- (i) Large enterprises employing over 50 workers with highly structured organisation and modern technology.
- (ii) Medium sized enterprises employing 10 to 50 workers with relatively unstructured organisation (predominantly family-managed) using rather dated technology.
- (iii) Small enterprises with employment size small enough to exempt them from the stipulations of the Factories Act, but using modern technology so as to be able to meet the requirements of sophisticated intermediate products of the large enterprises. Most of these enterprises have been helped by the large enterprises in their start-up by provision of financial assistance or machinery or both. We refer to them as 'sponsored' enterprises in this study.
- (iv) Very small enterprises with employment sizes similar as of enterprises under (iii), but using dated technology. These units either make final products independently or supply such intermediate products to large enterprises as require little skill and sophistication in their production.

The enterprises in categories (i) and (iii) would, by and large, meet the criteria of formal sector and those in categories (ii) and (iv) that of the informal sector. We have, however, stuck to the distinction between the 'large' and 'small' enterprises in our study including (i) and (ii) under 'large' and (iii) and (iv) under 'small' category. It may also be noted that our concept of 'small' enterprise thus does not follow the definition followed by Government agencies for providing assistance to such enterprises. According to the official definition an enterprise having a fixed capital investment of upto Rs.1 million is considered a 'small' enterprise.

I.3. Metal Engineering Industry in Kanpur

There were 690 enterprises reported in existence in the metal engineering industry in Kanpur as on March 31, 1977. Of them, 181 belonged to the category of large enterprises and 509 to that of small enterprises. Distribution of enterprises by product group (at 3-digit level of standard Industrial Classification) is given in Annexure 1. There are 30 product groups identified in the industry but the following six product groups (accounting for the percentage of enterprises mentioned in parentheses) together account for around two-thirds of the total enterprises: Manufacturing of hand-tools and general hardware (23), foundries for casting and forging iron and steel (14), manufacture and repair of miscellaneous non-electrical machinery items (12), manufacture and fabrication of metal products, tin plates, containers, barrels, drums etc.(9) and industrial machinery for food and textiles (7).

Small enterprises preponderate over large ones in almost all product groups except in the manufacture of (i) metal utensils, cutlery and kitchenware, and (ii) agricultural machinery, equipments and parts. In product groups iron and steel, insulated wire and cables, and railway wagons and coaches no small enterprise is reported to exist. In these product groups large enterprises are also very few. In the miscellaneous manufactures and repairs all enterprises are in the small sector.

The industry has experienced considerable expansion during the last 30 years due to priority given to it by national government under Five Year development plans. The number of large enterprises increased 10 times and that of small enterprises 20 times during 1947-1977. About 42 per cent of the large enterprises and 56 per cent of the small enterprises have come up only during the last 10 years. The distribution of new enterprises among various product groups was, however, not significantly different from the distribution of old enterprises both in the large and the small sectors. Thus the industry did not experience any marked structural changes during this period.

The metal engineering industry in Kanpur employed over 14,000 workers, and its investment in fixed capital, equipment and machinery amounted to Rs.100 million¹ in 1977. Twenty two per cent of the workers and nearly 16 per cent of the fixed capital (measured in terms of the book value of plant and machinery) were estimated to belong to the small sector. Small enterprises, however, had a greater proportion (58 per cent) of workers in the occupations classified as skilled in comparison to the large enterprises (35 per cent). This may be due to fixity of technical proportions between machinery and skilled workers coupled with limited opportunities for division of labour in the small sector units.

¹ Official exchange rate in 1977 was Rs.8.60 per US Dollar.

The number of skilled workers is directly dependent upon the number of machines but the number of unskilled workers varies with the size of output. The small enterprises, therefore, have to employ a minimum complement of skilled workers, who may also sometimes perform the unskilled work. But their requirements of unskilled workers are relatively small due to small size of operations. The large enterprises, on the other hand, employ a relatively larger number of unskilled workers to carry out production on a large scale, while they tend to enjoy economies of scale in relation to the skilled workers.

Capital intensity is found to be higher in the large enterprises : the capital requirement per worker in the large enterprises is 80 per cent higher than in the small enterprises. The productivity of labour, on the other hand, is 60 per cent higher in the large as compared to the small enterprises. Thus, the productivity advantage of the large sector does not adequately compensate for its higher capital requirement per worker.

The main points emerging from the above discussion which may serve as a background for subsequent analysis may now be summarised as follows: (i) while the industrial policy pursued by the government has encouraged the growth of small sector, no well-defined approach for integrating small enterprises with the large enterprises has been evolved; (ii) expansion in demand has made an expansion of both the sectors possible; (iii) both large and small enterprises have tended to concentrate in the same product

groups. To the extent this does not imply existence of sub-contracting arrangements, the simultaneous expansion of enterprises in both sectors in similar product lines is likely to lead to predominantly competitive relationship between the large and the small enterprises; (iv) while more employment per unit of capital may be generated by encouraging small enterprises, economic use of resources could be improved through cooperation between the large and small sectors with the intent of raising output-labour ratio in the small enterprises.

I.4. Sample and Data

The analysis in the present study is based on the data relating to 104 large and 237 small enterprises. We started with the intention of covering the entire universe of 181 large enterprises which were listed in the register maintained under Factories Act with the Office of the Chief Inspector of Factories, Uttar Pradesh, Kanpur; and 509 small enterprises having in the past registered with the Directorate of Industries and entered in the list compiled by them in connection with the Census of Small Enterprises. On actual investigation it was, however, found that a number of enterprises, particularly among the small enterprises, had ceased to exist; quite a few had changed over to some other line of production, a sizeable number refused to supply information, while information supplied by a few others was not found reliable and usable; and a small number in either sector could not be traced at their registered addresses. Table 1 gives the

numbers in each of these categories by sector. Disregarding the enterprises which had either closed operations or had shifted to a line of business other than metal engineering,

Table 1
Sample Coverage of the Universe

	SECTOR		Total
	Large	Small	
Number of registered enterprises	181	509	690
Closed	9	163*	172
Changed line of production	15	25	40
Did not cooperate	43	47	90
Questionnaires rejected	5	20	25
Not traceable	5	17	22
Effective sample	104	237	341

* This figure suggests an abnormally high mortality rate. It should, however, be noted that the universe represents a cumulative total of registrations over the years, and this figure also represents the total of closures having taken place during these years. A wide discrepancy between the figures of registrations and of actually operating enterprises in the small sector, which does reflect a high mortality rate, seems common: the Census of the registered small enterprises undertaken by Development Commissioner, Small Scale Industries, Government of India in 1972 reported a total of 37,390 such enterprises in U.P. but the actual survey of all operating enterprises undertaken during the following year revealed only 12,848 enterprises.

the effective universe consisted of 478 enterprises, 157 in the large and 321 in the small sector. The effective sample, thus, constituted 71.64 per cent of

functioning enterprises; 66.24 per cent among the large enterprises and 73.83 per cent among the small enterprises. The product-wise distribution of the sample is not strictly in line with the distribution of the universe due to the difficulties of controlling the sample as narrated above. Yet, all the important product groups have been adequately represented and relative proportions of product groups in the sample are not violently at variance with the corresponding proportions in the universe.

Information required for the study was collected on the basis of personal interviews of sample enterprises with the help of structured questionnaires. Two separate questionnaires were used for collecting data from the large and small enterprises. The field survey was conducted during October 1977 to May 1978. A supplementary investigation among large enterprises was made during February-March 1979 with a view to obtaining information relating to some of the qualitative and motivational aspects of sub-contracting.

II. EXTENT AND TYPES OF LINKAGES

Technological linkages between the two sectors are expected to take one or more of the following forms: (i) transfer of equipments, (ii) sharing of technical know-how and (iii) transfer of skills. They may take

place through (i) sub-contracting arrangements, (ii) sale or hire of machinery, (iii) organisation of training programmes by large enterprises for the benefit of small enterprises and (iv) deputation of skilled employees from large to small enterprises. In addition, transfer may take place autonomously due to movement of skilled workers from large to small sector or when a former large sector employee undertakes production in the same industry as an entrepreneur.²

The extent and pattern of technological cooperation between the large and small sector enterprises would generally follow the pattern of their market relationships— independent, inter-dependent or competitive. One can presume that in the case of independent markets for the products of the large and small sectors, any technological linkage between the enterprises in the two sectors would be restricted to input linkages.³ In the case of competitive situation, the small enterprises would be obliged to use a technology comparable to that used by the large enterprises, but it is more likely that the small enterprises acquire the technology independently and do not get it on 'transfer' from the large enterprises. In a situation of inter-dependence, the most likely form of which may be found in the small enterprises producing

² cf. Susumu Watanabe, 'Technological Linkages between Formal and Informal Sectors of Manufacturing Industries', Working Paper No. 34, World Employment Programme Research, ILO, Geneva, 1978.

³ cf. Ibid., pp. 11-12.

intermediate goods for the large sector enterprises, technologically the two types of enterprises have got to be linked and it is also more likely that the small enterprises get their technology from the large sector ones. In this category 'intermediate' products may be interpreted to mean not only 'inputs' in the technical production sense, but also to include such products which are more or less in the finished form procured by the large enterprises from the small enterprises and are packaged, branded and marketed.

II.1. Inter-sectoral Linkages : Overall

Overall, 41 per cent of the small enterprises and 36 per cent of the large enterprises reported having some linkages with enterprises in the other sector. (Table 2). The predominant form of linkages was sale and purchase of each others' products⁴ all the linked enterprises of the large sector and 91 out of the 97 linked enterprises in the small sector reported having such arrangements. Although 70 per cent of the large enterprises buy their supply of intermediate products from outside, almost half of them had no regular arrangements. Of those having regular arrangements with small enterprises 50 per cent purchased intermediate products on prior order basis with supply of material and the

⁴ This arrangement will be referred to as 'market linkages' or 'sub-contracting' in the following analysis, inter-changeably.

other 50 per cent without supplying material to their sub-contractors. Of the small sector enterprises having regular arrangement for sale of their products to large enterprises 43 per cent received material with orders while 57 per cent used their own material. Six per cent among the small enterprises also sold their product to the large enterprises without any prior arrangements.

Table 2

Extent and Types of Linkages
(Number of Enterprises)

Enterprises with	SECTOR		Total
	Large	Small	
Sample	104	237	341
Technological linkage only	0	6	6
Market linkage only	20	58	78
Technological linkages and market linkage	17	33	50
<u>Any type of linkages</u>	<u>37</u>	<u>97</u>	<u>134</u>
<u>Market Linkages</u>			
i. With supply of material	18	39	57
ii. Without supply of material	19	52	71
iii. Total	<u>37</u>	<u>91</u>	<u>128</u>
<u>Technological Linkages Involving</u>			
i. Transfer of equipment	2	11	13
ii. Product specification and design	13	16	29
iii. Training of workers	2	Nil	2
iv. Deputisation	Nil	2	2
v. Voluntary movement of workers from large to small sector		10	10
vi. Total Technological Linkage	<u>17</u>	<u>39</u>	<u>56</u>

Transfer of equipment, know-how and skills was reported by 17 large and 39 small enterprises, constituting 16 per cent of enterprises in the respective sectors. In the large sector technological linkages were combined with sub-contracting arrangements in all the cases; while in the small sector, six enterprises had technological linkages without market linkages. Of these six cases, the linkages involved transfer of skills in the form of recruitment of skilled workers from the large enterprises in three cases; know-how transfer in the form of product specification in two cases and transfer of equipment in the form of purchase of used machinery in one case. The other 33 small sector enterprises which had technological linkages also had arrangements for sale of their products to the large enterprises. So far as the mode of technology transfer is concerned, 4 per cent small enterprises got some of their equipment on transfer from large enterprises, 6 per cent received product specifications and designs, none had training of their workers by large enterprises, 1 per cent had employees of large enterprises on deputation with them and 3 per cent reported employment of ex-employees of large enterprises. Forty per cent of the small sector entrepreneurs were, however, earlier employees of the large enterprises in the same product lines in which they are now engaged.

In the large sector, on the other hand, of the 17 enterprises reporting technological linkages of one type or the other, 13 supplied know-how, mainly in the form of

specifications and designs; two sold used machines to small enterprises while another two provided training to 32 workers of two small enterprises. The large enterprises, however, had no information about the workers who left them to join the small sector enterprises.

We may now summarise the above description of extent and types of linkages between the large and small sectors: (i) Most of the enterprises in either sector function independently without having any regular market or technological relationship with enterprises in the other sector. (ii) Market linkages in the form of subcontracting arrangements are the central and predominant form of interrelationship between the sectors. (iii) In majority of cases of interrelationship, market linkages exist independently of any form of technological cooperation between the enterprises in two sectors. (iv) Technological linkages are mostly accompanied with market linkages; they exist independently only in a few cases. It may, however, be noted that the most important form of technological linkages consists of product specification and designs given along with supply order by large to small enterprises; and it is generally seen that the specifications given are too simple and general (e.g. size, type of material to be used, etc.) to involve any real transfer of technology. Transfer of skills is found to take place in Kanpur metal engineering industry mainly in the form of workers of the large

enterprises, voluntarily leaving to join small enterprises as employees, or in most cases, to start their own enterprises.

II.2. Product Groups and Linkages

The extent and pattern of linkages, however, differ among different product groups. Although almost all the product groups included in our sample of metal engineering industry in Kanpur, have at least a few enterprises either in the large or small or both sectors which have one or the other types of linkages, their extent is highly different from product group to product group (Annexure 2). The following product groups show relatively high degree of inter-sectoral linkages : casting and forging of iron and steel; metal furniture and fixtures; enamelling, lacquering, galvanising, polishing etc.; industrial machinery (other than food and textiles); manufacture, alteration and repair of general machinery; manufacture of machine tools, their parts and accessories; manufacture of motor vehicles and parts; miscellaneous metal manufactures and repair of motor vehicles and motor cycles. Taking the sample enterprises in these groups in large and small sectors together, we find that at least 50 per cent of enterprises in each of them have linkages with enterprises in the other sectors (Table 3).

Table 3 also gives the distribution of linked enterprises by types of linkages for different groups. Technological linkages alone were reported in 11 per cent of the

Table - 3

Extent and Types of Linkages by Product Groups

Product Group	Description	% of Linked Enterprises					Type of Linkages		
		Large	Small	Combined	T.L. only	M.L. only	T.L. & M.L. combined		
1	2	3	4	5	6	7	8		
331	Foundries for casting and forging iron and steel	58.82	44.44	53.85	0	26.92	26.92		
340	Manufacture of fabricated metal products such as metal cans from tin-plate, enamelled sheet metal, metal shipping, containers, barrels, drums, kegs, safes, vaults, enamelled sanitary and all other fabricated metal products not elsewhere classified	16.67	46.15	32.00	4.00	24.00	4.00		
341	Manufacture of structural metal products	100.00	20.00	27.27	0	18.18	9.09		
342	Manufacture of furniture and fixtures primarily of metal	100.00	50.00	66.67	11.11	33.33	22.22		
343	Manufacture of hand tools and general hardware	70.00	23.40	31.58	1.75	19.30	10.53		
344	Enamelling, japanning, lacquering, plating and polishing of metal products	33.33	56.25	52.63	5.26	26.32	21.05		
345	Manufacture of metal utensils, cutlery and kitchenware	16.67	50.00	25.00	0	18.75	6.25		
349	Manufacture of metal products except machinery and transport equipment, not elsewhere classified like type foundry	12.50	40.00	27.78	0	5.56	22.22		
350	Manufacture of agricultural machinery and equipments and parts	11.11	30.00	21.05	5.26	10.53	5.26		

1	2	3	4	5	6	7	8
353	Industrial machinery for food and textile industries	0	50.00	33.33	0	16.67	16.67
354	Industrial machinery for other than food and textile industries	100.00	50.00	63.64	0	45.45	18.18
356	Manufacture, alteration and repair of general items of non-electrical and accessories not elsewhere classified e.g. manufacture and repair of size reduction equipment like Pentagraph Monograph, etc. crushers, conveyors, bucket, elevators, ship hoist cranes, derricks etc., mixers and reactors, centrifugal machines, driers, etc., power driven pumps etc., air gas compressors and vacuum pumps (excluding electrical furnaces)	0	66.67	66.67	0	33.33	33.33
357	Manufacture of machine tools, their parts and accessories	0	62.50	58.82	5.88	23.53	29.41
359	Manufacture and repair of non-electrical machinery and equipment, components and accessories not elsewhere classified (such as sewing machines automatic mechanising machines, washing, laundry dry-cleaning and pressing machines, cooking ranges and ovens, other service industry machines, arms and armaments)	11.11	41.51	37.10	0	30.65	6.45
374	Manufacture of motor vehicles and parts	0	61.54	61.54	0	30.77	30.77
376	Manufacture of bicycles, cycle rickshaw and parts	62.50	25.00	43.75	0	6.25	37.50
387	Manufacture of Miscellaneous Metal Goods	0	66.67	66.67	0	66.67	0
392	Repair of motor vehicles and motor cycles	0	50.00	50.00	0	50.00	0
TOTAL		35.58	40.93	39.30	1.76	22.87	14.66

Note : T.L. = Technological Linkages
M.L. = Market Linkages

sample enterprises in product group manufacture of metal furniture and fixtures; and in 4 to 6 per cent of enterprises engaged in fabrication of metal products, tin plates, containers etc.; enamelling, lacquering etc; agricultural machinery, implements and parts; and, manufacture of machines, tools and accessories. In miscellaneous metal manufacture and repair of motor vehicles, all linked enterprises reported only market linkages. Market linkages were accompanied by technological linkages in over one-half of the linked enterprises in the following product groups: iron foundries, manufacture of miscellaneous metal products, industrial machinery for food and textile industries, miscellaneous non-electrical machinery, machine tools, parts and accessories, motor vehicles and parts and bicycles, tricycles and parts. In all other product groups, market linkages alone constituted the major form of inter-sectoral relationship among the linked enterprises.

II.3. Degree of Market Linkages

Let us examine the degree of market interdependence of the linked enterprises : how far the small enterprises are dependent on the large enterprises for the outlet of their products; and, how far the large enterprises depend on small enterprises for the supply of intermediate products. It is estimated that around 27 per cent of the output of the large sector linked enterprises was contributed by small enterprises. The small enterprises

which have entered into some arrangements with large enterprises for sale of their products, depend substantially on them for the marketing of their product. We find that 75 small enterprises which supply intermediate products to large enterprises on the basis of prior orders, sell 61 per cent of their output under this arrangement. They also sell 15.5 per cent of their output to enterprises in the small sector itself on a prior order basis. Around seven per cent of their product is sold to large producers without any prior arrangement.

As we already noted the large enterprises enter into two types of sub-contracting arrangements with the small enterprises : purchase on the basis of prior orders without supplying material; and contracting out manufacture of certain processes with supply of material. Most of those engaged in the second type of arrangements have two or three small sector enterprises as their sub-contractors; and, around one-fifth of the requirements of intermediate products, on an average, are got manufactured under this arrangement. Under the first type of arrangement, around 53 per cent of the requirements of intermediate products of large enterprises is supplied by the small enterprises. Under both the arrangements combined around 40 per cent of the requirements of large enterprises is procured from small enterprises.

Thus the dependence of the small sector enterprises on the large enterprises for marketing their products is

greater than that of the large enterprises on small enterprises for supplies of intermediate products. In iron foundries, manufacture of food and textiles machinery, manufacture of motor vehicles and parts, and bicycles, tricycles and parts, the linked small enterprises depend on the large ones for sale of 80 to 100 per cent of their product. Small linked enterprises in product groups enamelling, japanning, lacquering etc., agricultural machinery and equipments, machinery for industries other than food and textiles, miscellaneous machinery items and machine tools, parts and accessories, depend on large sector for the sale of 50 to 80 per cent of their product. It may, however, be noted that the nature of work contracted out by most of the large enterprises, particularly by those belonging to the employment size group 10 to 50 workers, consists mainly of simple foundry work, drilling of holes or smoothing or polishing the surface of some metal products and thus does not involve much skill. Therefore, they do not insist on supervision of the contracted work as a part of the terms of contract. Only in the case of the relatively larger enterprises who have sponsored one or two smaller enterprises to get part of their work carried out on the basis of sub-contracting to them that all types of work including that requiring use of critical skills is contracted out. In these cases constant supervision by parent firm at all stages of production forms a part of the terms of contract. The sponsor-sponsored relationships are mostly observed in the manufacture of agricultural implements and machinery,

metal utensils and security equipment such as steel safes and padlocks.

The predominant form of arrangement for procurement on prior order basis is the purchase of a fixed quantity at market price. In a few cases, particularly in the cases of sponsored enterprises, fixed quantities are purchased at fixed pre-arranged prices, generally allowing for a 10 to 15 per cent margin of profit over cost of production to them.

II.4. Extent of Technology Transfer

As observed earlier, 16 per cent of total enterprises were found to have inter-sectoral technological linkages. The predominant form of these linkages consists of transfer of know-how in the form of specification and designs given by large enterprises to the small enterprises as part of the assignment of work. Eleven small enterprises, of course, got technology embodied in equipment and machinery transferred from large enterprises. It is estimated that of the total machinery and equipment purchased by all linked enterprises in the small sector, 27 per cent (in value terms) was procured by these enterprises from large units (Table 4). It may be noted that the capital acquired from large enterprises constitutes a larger component of the total acquisition of equipment in the case of enterprises set up during the last five years as compared to the older enterprises. In fact, the percentage

Table 4

Procurement of Machinery and Equipment by
Small Enterprises (Linked Only)

Age of the enterprises (in years)	Value of machinery and equipment added since inception	Value of machinery and equipment added during last 5 years	Percentage of (3) to (2)	Value of machinery and equipment purchased from large enterprises*	Percentage of (5) to (3)
1	2	3	4	5	6
Less than 5	148650	148650	100.00	49150	33.07
5 - 10	105895	85254	80.51	20200	23.69
10 - 20	314855	137444	43.65	36200	11.50
20 - 30	104450	18050	17.28	-	0.00
TOTAL	673850	389398	58.00	105550	27.11

* There were 11 enterprises who purchased machinery and equipment from large enterprises, 5 of them falling in the age group less than 5 years, 4 in 5-10 years and 2 in 10-20 years.

of capital acquired from the large enterprises consistently declines with increase in the age of the small enterprises and tapers off to zero in case of enterprises older than 20 years. This phenomenon suggests that the large enterprises seek sub-contracting and provide technical cooperation more to the newer small enterprises.

Terms of purchase of equipment from large enterprises in all cases were payment in cash. But if we relate the value of machinery and equipment acquired by small enterprises during last five years to the financial assistance received by them from large enterprises during

this period it seems that 50 per cent of purchase of equipment through this arrangement was financed out of the assistance received from them. In fact, all those who received financial assistance during the last five years admitted that they used it for buying machinery, only one enterprise reported that it used the financial assistance for building also.

So far as the transfer of skills is concerned, it is found that of the new workers recruited by the linked small enterprises during the last five years, about 13 per cent consisted of workers who moved from large enterprises. While it was reported by the small enterprises that almost all of the workers coming from the large sector were working in skilled jobs, the movement was almost invariably voluntary rather than as a part of arrangement between the enterprises in two sectors. To this one may add the transfer of skills effected through the large sector workers moving as entrepreneurs in the small sector, which as mentioned earlier was the case in 40 per cent of small enterprises.

II.5. Age, Size and Linkages

Technological characteristics of a product—multi-stage or integrated process of manufacture—is no, doubt, a major factor accounting for difference in the degree of linkages. But such characteristics as size and age of the enterprises may have some influence on whether an enterprise has its activities inter-linked with those of other

enterprises or functions independently. It is generally observed that older a large enterprise, higher is the tendency on its part to enter into a sub-contracting arrangement or other forms of relationship with small enterprises (Table 5). No doubt, a small number which

Table 5
Age and Linkages

Age of enterprise (in years)	LARGE ENTERPRISES			SMALL ENTERPRISES		
	Total No.of enter- prises	No.of enter- prises with linka- ges	Perce- ntage (2) to (1)	Total No.of enter- prises	No.of enter- prises with linka- ges	Perce- ntage of (5) to (4)
0	1	2	3	4	5	6
Less than 5	11	4	36.36	56	26	43.21
5 - 10	33	9	27.27	77	22	28.57
10 - 20	35	12	34.28	68	24	35.30
20 - 30	15	7	44.66	27	8	29.90
More than 30	10	5	50.00	12	6	50.00
TOTAL	104	37	35.57	237	97	41.80

fall in the very young (0 to 5 years) group also show a higher extent of linkages than those in the age-group 5-10 and 10-20 years, but the percentage of enterprises having linkages steadily increases with the age beginning with 5-10 years age group. The enterprises with linkages are on an average 17 years old while those without, have an average age of 13 years.

Among the small sector enterprises, it was found that the very young (less than 5 years old) and, very old (30 years and above) have the largest percentage of enterprises among them having linkages with the large enterprises. It may, however, be noted that there were only a small number of enterprises in the 'very old' group, and once they are ignored and the first two groups are merged we find a declining tendency in the extent of linkages with increase in the age of small enterprises. Average age of the linked enterprises was found to be 10.2 years and that of the non-linked enterprises 13.3 years in the small sector.

So far as the size-linkage relationship in the large sector is concerned, there is a feeble but consistent tendency for the linkages to decline as we move from smaller to larger size group (Table 6). The relatively small among the large enterprises are also older and have not been in a position to increase their capacity to cope with the increasing demand for their products. A few of them have shed off some of their activities while in larger number of cases they decided to increase their output by contracting work out to other enterprises rather than investing for augmenting capacity of their plants. The net result has been an increased dependence of the large enterprises on the small ones for supplies of their requirements of intermediate inputs. The newer factories, on the other hand, started on relatively large scale and most of the time, have the capacity to produce their requirements of intermediate products within their

plants. The factories which do not have any arrangement with small enterprises have an average size of 60 workers against 30 of those having such linkages.

Table 6
Employment Size and Linkages

Employment size (Number of workers)	Total number of enterprises	Number of enterprises with linkages	Percentage of (2) to (1)
0	1	2	3
I. LARGE ENTERPRISES			
Less than 20	43	17	37.77
20 - 50	42	15	35.71
50 - 100	10	3	30.00
100 - 500	7	2	28.57
More than 500	2	-	-
TOTAL	104	37	35.58
AVERAGE SIZE	60	30	
II. SMALL ENTERPRISES			
1	9	2	22.22
2 - 3	56	17	30.36
3 - 10	160	70	43.75
10 - 20	9	6	66.66
More than 20	3	2	66.66
TOTAL	237	97	40.93
AVERAGE SIZE	5.1	6.1	

A declining tendency in the extent of linkages is noticeable in terms of capital size also : 55 per cent of the enterprises with capital size upto Rs.1 lakh, 51 per cent of enterprises with capital size ranging between Rs.1 lakh to Rs.5 lakhs, 36 per cent of those with capital size

ranging between Rs.5 to 10 lakhs, and 28 per cent of those in the capital size group of Rs.10 lakhs and above were found having linkages with small enterprises.

In the small sector, the linkages with the large sector are found to increase with the increase in the size of the enterprise. Of the single worker unit only 22 per cent and of units with 2-3 workers 30 per cent had linkages with large sector enterprises; while the percentage rose to 44 in the case of enterprises employing 4 to 10 workers and to 66 in the case of those employing more than 10 workers. Similar trends are discernible if size is measured in terms of the total productive capital employed. Of the very small enterprises employing upto Rs.10,000 of capital only 22 per cent are linked, of those with total capital of Rs.10,000 to Rs.25,000, 30 per cent are linked; of those with a total capital of more than Rs.25,000, over 50 per cent are linked with large enterprises.

III. MOTIVATION FOR SUB-CONTRACTING

It is obvious that the enterprises in the two sectors would enter into and continue to have sub-contracting arrangements, only if, in their judgment, they gain from such link up. The gains could take the form of enhanced production and profits, avoidance of loss or maintenance of the market share. So far as the small enterprises are concerned, they have limited production capacity which they would need to utilise fully for

maintaining a minimum production and income level. They are also generally found deficient in marketing, particularly when they are faced with competition from the **larger** enterprises. For them, therefore, linkage arrangements with the large enterprises can provide (i) an opportunity to make fuller use of whatever little productive capacity they have and (ii) a measure of protection against competition. The initiative for linkages would, however, come in most cases from the large enterprises who have work to sub-contract. We, therefore, attempted an investigation into their motivations for entering into linkage arrangements. The specific issue on which we focussed attention related to the reasons due to which the large enterprises prefer to sub-contract work rather than install necessary machinery at their own plant to carry out the entire production.

III.1. Capacity and Linkages

The large enterprises contracting out work to small ones fall broadly in two groups : those which do not have the machinery to carry out the work which they contract out; and those which have the machinery but their existing capacity is not adequate to meet the demand for their products. The former group consists predominantly of 'medium' sized enterprises—those having less than 50 workers, while the latter comprises mostly 'larger' enterprises employing more than 50 workers. It is pertinent, in this connection, to point out that the 'medium'

sized enterprises are largely dependent on direct orders from users of their products, mostly 'large' enterprises and do not often put their products on the market for sale. The extent of utilisation of their installed capacity, dependent as it is on the volume of orders they are able to get from 'larger' enterprises, is often quite low. The range of utilisation of their capacity varied between 33 per cent to 45 per cent. On the other hand, the 'larger' enterprises reported full capacity utilisation, except a few cases where production is subject to seasonality of demand.

In spite of underutilisation of their capacity, the 'medium' enterprises continue to sub-contract because of the lack of complementary equipment : they have surplus capacity in some lines of work but no equipment to carry out some of the allied work. They would sub-contract to any unit or units depending on the condition and convenience at that time. Still a sizeable proportion of these enterprises report that they have continued to sub-contract to the same enterprises over a number of years, because the latter have become familiar with the type of work expected of them; and it also saves them the inconvenience of identifying new sub-contractors and settling terms afresh every time. The 'larger' enterprises have, however, preferred to help establish one or two small enterprises to work as their sub-contractors.

III.2. Constraints on Capacity Expansion in Large Sector

It is evident that the linked enterprises both in the 'medium' and 'larger' categories within the large sector have preferred sub-contracting to adding to their capacity to carry out entire work relating to their production. Our discussions with these entrepreneurs also revealed that it is more often the constraints and problems associated with expansion of capacity, rather than explicit advantages flowing from the arrangement, that have led to the practice of sub-contracting. The constraints and problems mentioned in this regard are discussed in the following paragraphs.

The 'medium' sized entrepreneurs attributed their reluctance to expand their capacity, and the practice of sub-contracting work to other enterprises, mainly to the various problems associated with the large size of employment. One type of problems related with the application of certain legal enactments such as Employees State Insurance Act, etc. which become applicable once the number of workers on the roll of the enterprise crosses a specified limit, and thus raised the unit labour cost. Application of legal enactments also implies frequent inspection by government officials and filing periodical returns. The entrepreneurs are generally found averse to regulation and inspection, which according to them, prove very bothersome and inconvenient, besides raising the cost of administration.

Till recently, some taxes such as excise duty were levied at a progressive rate in relation to the size groups of employment. (Now the basis has been changed to value of turnover). Regulated wages also tend to rise with growth of size of employment beyond 50 workers. Beside these factors which raise costs of production, the entrepreneurs in this group who run their business mostly on family and proprietary basis are generally reluctant to share authority, control and business information with hired managers and supervisors which would become necessary once the enterprise grows large. As we have observed earlier, most of the enterprises in the large sector have employment sizes of either 10-20 or 20-50 workers, a sizeable percentage (around 37) of them enter into sub-contracting arrangements due to the above mentioned considerations.

Enterprises employing over 50 workers are already subject to the legislative and other factors mentioned above, and therefore, these factors as such need not restrain their expansion.⁵ Some of them, particularly in the manufacture of agricultural implements and machinery, metal utensils and security equipments such as safes and padlocks, have preferred sub-contracting to capacity expansion. The enterprises in these product lines are

⁵ Although we also came across a case where an enterprise, with a view to saving on cost incumbent upon these factors, reduced its employment from 80 workers in 1972 to less than 50 workers in 1977, and maintained its production level by transferring part of its equipment to two small units and sub-contracting work to them.

well established in the market and are in an oligopolistic situation with a few rivals. The demand for their product has been expanding, but most of them have reached the production level where the unit cost of production has an increasing trend. Yet they would not like to stop expanding their production, for that would mean loss in the market share. They, therefore, increasingly depend on sub-contracting for large part of their production, which is possible at a cost lower than what they would have incurred within their plants. They generally admit that the cost they pay to the sub-contractors is either equal to or lower than the average cost of production within their plants, but the marginal cost of production internally would have been higher than the average cost in sub-contracting.

Two other factors motivating the large enterprises to sub-contract work are: lack of space and minimization of fixed overhead costs where demand for the product is of a seasonal character. Availability of suitable space for expansion of capacity at reasonable rates is a problem commonly faced in the crowded part of Kanpur city; and some of the enterprises have, therefore, to get a part of their work done at other already existing enterprises. Similarly, it would be uneconomical for enterprises producing goods with highly fluctuating demand to install capacity to meet the peak demand; instead, they maintain a minimum capacity to meet the average level of demand during the year and sub-contract work on heavy orders they get in peak season.

III.3. Motivations for Sponsoring Sub-contractors

We have observed that the 'larger' enterprises have preferred to assist the coming up of their sub-contractors rather than to sub-contract work to the already existing enterprises in the small sector. They have sponsored their establishment by transferring part of their equipment and also helping financially. The 'medium' sized enterprises neither have the capacity nor need to sponsor their sub-contractors. But the 'larger' enterprises have adopted this method for the following reasons: One, most of these enterprises being well established in the market, are very particular about timely supply of goods to their bulk purchasers, lest they lose them and the market share. Therefore, they cannot afford the uncertainty in keeping to production schedule which may arise if they sub-contracted work to enterprises over whom they have no control. Second, their products have a reputation for quality and, therefore, they would like to get them processed by enterprises who have the requisite quality of machinery and level of sophistication in technology. They ensure it by either transferring their own equipment or by giving financial assistance to their sub-contractors to acquire it. Third, most of the time the manufacturing process of their product is patented and final product branded, which they would not like to be pirated, which, they fear, might happen if they chose their sub-contractors from among the existing enterprises in the industry.

It may also be mentioned that there are motives of

avoiding certain legislative and fiscal burdens, as noted earlier, which lead the large enterprises to sponsor their sub-contractors, whether the entrepreneurs admit it or not. In most cases, the ownership of the sponsored enterprises can be traced back to the owners of the parent enterprises. Splitting, or starting a new enterprise as a separate legal entity rather than expanding the existing one, helps in such cases to reduce tax burden, as most of the taxes on production enterprises have a considerable degree of progression and after a level, an expansion may result into the enterprise moving in a slab with a substantially higher rates of taxation.

The sponsored sub-contractors thus have a special kind of relationship with the large enterprises which contract out work to them. As mentioned earlier, they get all kind of work unlike the non-sponsored small enterprises which mainly get unskilled and semi-skilled kind of jobs. Payment for their work includes a reasonable margin of profit over the cost. The profit margin, however, is fixed as part of the contract, and, therefore, gains in profits resulting from the buoyancy of the market accrue mainly to the parent firm. The sponsor enterprises provide sufficient work to them to ensure full utilisation of their capacity. To the extent the sponsors are unable to provide sufficient work, they have the freedom to accept work from others. However, a tacit understanding exists between the two parties that the sub-contractors will not

give priority to others' work over that of the parent firm, and will not charge lower prices from the rivals of their sponsors.

III.4. Selection of Sub-contractors

The large enterprises which have sponsored some small enterprises obviously prefer to get most of their sub-contracted work done by them. But it is not as if those not having sponsored sub-contractors get their work done from all and sundry. From our discussion earlier, it is clear that generally the very small and old enterprises in the small sector hardly get any work sub-contracted to them. Capacity and relatively new technology and equipment are thus important considerations in the selection of sub-contractors. In the small sector, relatively large capacity and modern technology are acquired by enterprises during the recent years on the basis of financial and technical assistance from government agencies and public institutions. That is why we find that most of the small enterprises which have availed of such assistance have also received work on sub-contract from the large enterprises. To a certain extent two phenomena may be only indirectly related through a third factor, namely, the characteristics of the small sector entrepreneurs : the entrepreneurs who look for and avail of the assistance for establishment of their enterprises may also be the ones who look for and are able to secure regular orders from large enterprises. It is quite likely

as the new entrepreneurs are better educated and informed and have an outward looking outlook.

That the large entrepreneurs select their sub-contractors carefully is evident from the fact that not many of them had complaints regarding delivery time, quality and cost of sub-contracted work. Almost all large enterprises sub-contracting work reported that their sub-contractors adhere, by and large, to the time schedule given to them. Competition among small enterprises itself seems a good insurance for timely completion of sub-contracted work. Only one to two per cent of the goods supplied by sub-contractors are rejected. Even in these cases, no outright rejection is involved, the defects are set right as much as possible by the sub-contractors. To a certain extent, the low rejection rate is the result of the inability of the medium sized enterprises in the large sector to set very exacting standards due to their heavy dependence on small sub-contractors for the work for which they themselves do not have the necessary equipment; and also of the fact that work involving rather simple processes is generally sub-contracted. The 'larger' enterprises, as noted earlier, get their work done under close supervision in the plants of sponsored enterprises, and, therefore, there is a very little chance of dissatisfaction with the delivery schedule and quality of sub-contracted work. In one case where effective supervision could not be carried out in electroplating process sub-contracted, the parent enterprise was not satisfied with the quality of

work. Subsequently, sub-contracting of that process was discontinued and parent enterprise installed capacity for that purpose within its plant.

It was generally admitted by the enterprises sub-contracting work to small ones, that the cost is lower in sub-contracting than in internal production. In most of the sponsored sub-contractors' plans, however, the cost was reported to be similar as in the parent enterprises. One relatively large enterprise reported that the sub-contractors' cost is higher, yet the work continues to be contracted out with a view to maintaining a high volume of output.

IV. IMPACT OF MARKET AND TECHNOLOGICAL LINKAGES

Let us now turn to the question of the impact that the inter-sectoral linkages produce on the growth and efficiency of resource use in the enterprises. The indicators that we have chosen here are : growth of output and employment; capital intensity; and capital and labour productivity; and analysis is carried out on the basis of a comparison between the linked and non-linked enterprises in respect of these indicators.

IV.1. Growth of Output and Employment

On the question of relationship between linkages and growth of enterprise in terms of output and employment the following three issues may be considered important:

(i) how does the growth performance of linked enterprises compare with that of the non-linked enterprises? (ii) do linkages have differential impact on the growth of output and that of employment? and (iii) does growth lead to linkages or is the relationship reverse?

Linkages are, in general, found to be positively associated with the performance of enterprises in terms of growth of output and employment (Table 7). During 1972-1977 the small enterprises sector in the metal engineering industry in Kanpur registered an average rate

Table 7

Growth of Output and Employment : 1972-1977
(Per cent per annum)

Sector	OUTPUT			EMPLOYMENT		
	Linked	Non-linked	Total	Linked	Non-linked	Total
Small	7.62	2.25	6.38	10.35	8.56	9.42
Large	9.41	2.59	3.48	1.64	-1.41	-0.83

of growth of 6.38 per cent per annum in output and 9.42 per cent in employment. The growth of linked enterprises averaged to 7.62 per cent and that of non-linked ones to 2.25 per cent per annum; the employment growth has been of the order of 10.35 per cent per annum in the linked and 8.56 per cent in the non-linked enterprises. The large enterprises sector experienced a growth rate of output of 3.48 per cent per annum but a decline in employment at the rate of 0.83 per cent per annum. Such

large enterprises which have linkages with the small ones, however, increased their output at the rate of 9.41 per cent per annum as against 2.59 per cent of those which have no such arrangements. Similarly, the linked large enterprises increased their employment at an average rate of 1.64 per cent per annum as against 1.41 per cent decline in case of the non-linked ones.

Thus technologically and market-wise linked enterprises registered a better growth in terms of both output and employment in comparison to non-linked enterprises in each sector. It could, however, be argued that this association may simply be a reflection of the fact that certain product groups have generally grown faster as compared to others, and the former also happen to be the ones which have inter-sectoral linkages; and to this extent growth may not be a necessary accompaniment of linkages. The different product groups, no doubt, have varying opportunities for growth depending on general market conditions, pattern of growth of the economy and government policy of the time. These factors should, however, need not affect enterprises within a product group differently. It is found with a considerable degree of consistency that within a product group also the growth performance of the linked enterprises is found to be better than those of the non-linked ones (Table 8), and, therefore, the association between linkages and growth cannot be taken as spurious.

Table - 8

Growth of Linked and Non-Linked Enterprises by Product Group

Product Group	O u t p u t				E m p l o y m e n t				
	Large Sector		Small Sector		Large Sector		Small Sector		
	Linked	Non-Linked	Linked	Non-Linked	Linked	Non-Linked	Linked	Non-Linked	
1	2	3	4	5	6	7	8	9	
331	8.58	- 2.79	1.47	1.32	3.51	- 1.56	22.50	8.27	
340	4.51	3.52	12.65	9.52	2.25	4.56	9.12	4.28	
341	5.21	-*	12.83	5.11	1.71	-	-	2.49	
342	1.48	-	9.51	8.71	-4.13	-	9.21	- 2.20	
343	9.22	4.17	7.21	- 2.18	1.50	- 3.52	11.72	8.67	
344	32.12	21.79	12.77	3.06	17.77	0.41	10.10	8.33	
345	5.80	18.02	1.12	1.75	1.62	6.83	2.38	0.47	
349	7.23	6.05	28.31	6.12	5.78	4.67	2.22	5.28	
350	8.22	3.47	0.94	1.74	1.53	0.70	13.89	3.24	
353	-	- 1.52	3.71	2.47	-	- 6.01	3.13	2.75	
354	-0.94	-	6.27	2.32	4.44	-	5.29	1.89	
356	-	-	4.51	3.74	-	-	11.37	10.00	
357	-	15.71	11.75	6.59	-	7.66	0.15	- 4.82	
359	6.71	2.25	-4.30	-27.08	2.91	- 4.37	1.63	- 5.55	
374	-	-	3.90	4.00	-	-	1.11	15.42	
376	8.20	-14.83	7.33	6.12	5.12	-10.15	11.81	5.90	
387	-	-	18.56	5.16	-	-	6.66	5.30	
392	-	-	4.56	3.27	-	-	5.37	4.14	

*- = No unit in the sample

Coming to the question of the differential impact of linkages on growth of output and employment, it is noted that the linked enterprises have experienced a growth rate of employment much lower than that of output in the large sector while in case of such enterprises in the small sector the growth rate of employment has slightly exceeded the rate of growth of output. The linkages are largely a result of the desire on the part of large enterprises to take advantage of expanding demand for their products without at the same time increasing the size of employment and, therefore, one could expect large sector enterprises to show a growth pattern biased in favour of output rather than employment. As most of labour intensive processes are performed in small enterprises, high growth of output is naturally accompanied by a correspondingly high growth of employment in their case.

The causal sequence between linkages and growth is difficult to determine. Nevertheless, given the widely prevailing reluctance to expand on the part of large enterprises, for various reasons described earlier, it can be said that the emergence of a large number of small enterprises to whom they can sub-contract work, has undeniably helped growth of their output. The utilisation of sub-contractors has permitted them to save on the wage cost and keep total cost of production from rising and still produce adequate output to cope with the increasing demand. For 'medium' sized enterprises which do not have some of the essential complement of machinery and equipment

availability of sub-contractors is essential for survival irrespective of whether they experience growth in demand or not. In the case of 'larger' enterprises which are better equipped, it cannot but be emphasised that the stimulus for developing linkages emanates primarily from the general spurt in demand. In some cases this spurt in demand has been specific for the products of some of the large enterprises as a result of the diversion of demand from the products of their rival. Looked at from this angle, technological and market linkages act as growth facilitating rather than growth inducing factors; inducements to growth emanate generally from conditions of demand in the market.

IV.2. Capital Intensity and Productivity

One of the interesting characteristics of the metal engineering industry in Kanpur is a very low fixed capital base. Whereas the average total capital requirement per worker works out to Rs.34,351 in the large sector and Rs.19,222 in the small sector, the fixed capital per worker is Rs.10,446 in the former and Rs.5,290 in the latter (Table 9). Since many of the small sector enterprises are mainly engaged in alteration, repair and manufacture of parts and accessory mainly by manual operations, a low fixed capital base is understandable in their case. But it is quite low even in the large sector enterprises. But this is not surprising because many of the larger enterprises in Kanpur are engaged in

casting and forging, manufacture of fabricated metal products, manufacture of metal utensils, parts of agricultural machinery and implements and of other machinery, most of which is carried out with little fixed plant and equipment.

Table 9

Capital Intensity in Linked and
Non-linked Enterprises

Sector	TOTAL PRODUCTIVE CAPITAL PER WORKER (Rs.)			FIXED CAPITAL PER WORKER (Rs.)		
	Linked enter- prises	Non- linked enter- prises	Total	Linked enter- prises	Non- linked enter- prises	Total
Small	15781	22504	19222	7462	3640	5290
Large	22941	40652	34351	9071	11205	10446

Capital requirements per worker are generally lower in the linked than in the non-linked enterprises, except in case of the fixed capital per worker in the small sector which could probably be explained in terms of the practice of sub-contracting by large sector enterprises mainly to the better equipped small units. Looked at from another angle, the linked small enterprises are required to use a technology comparable with and to the satisfaction of their buyers in the large sector, and, therefore, have to invest relatively larger amounts in fixed capital as compared to the non-linked enterprises. The lower value of total productive capital per worker in

the linked small enterprises primarily reflects lower requirement of working capital made possible by quicker turnover of output. The lower fixed capital per worker in the linked large enterprises relatively to the non-linked ones is consistent with the fact that a greater proportion of the linked than of the non-linked enterprises, are older and employ less capital per worker.

Output and value added per unit of total as well as fixed capital are not markedly different for large and small sector enterprises (Table 10). As capital

Table 10
Capital Productivity (Ratios)

	LARGE SECTOR			SMALL SECTOR		
	Linked	Non-linked	Total	Linked	Non-linked	Total
Output to total capital	1.68	1.11	1.26	1.44	1.39	1.43
Value added to total capital	0.64	0.66	0.66	0.48	0.63	0.59
Output to fixed capital	4.23	4.02	4.16	3.05	8.59	5.21
Value added to fixed capital	1.62	2.40	2.16	1.02	3.91	2.15

intensity in the small sector is about half that in the large sector, the former has to achieve only one-half of labour productivity to have a level of capital efficiency comparable with the latter; and as we will

see later, the relative position of labour productivity in the two sectors closely corresponds to this condition.

Comparison of capital productivity between linked and non-linked enterprises does not reveal a consistent pattern. In the large sector while the linked enterprises show better efficiency of capital with respect to output, they compare unfavourably with the non-linked enterprises when capital efficiency is measured with respect to value added. This may be attributed to the fact that a sizeable part of their output is produced by sub-contractors and to this extent the ratio of value added within the plant to output is lower in their case as compared to the non-linked enterprises. The small sector linked enterprises reveal a marginally higher capital efficiency than the non-linked ones in terms of the ratio of output to total capital. Their performance level is somewhat lower than of the non-linked enterprises when the ratio of value added to total capital is used as an indicator of capital efficiency. But the level of their efficiency compares highly unfavourably with that of their non-linked counterparts, in terms of output and value added per unit of fixed capital. It is seen that the linked enterprises have a lower value of total capital per worker than that of the non-linked ones, but value of fixed capital per worker in linked enterprises is nearly double that of non-linked ones. With about the same labour productivity in the two types of enterprises, the ratio of output and value added to fixed capital therefore turns out to be

lower in the linked as compared to the non-linked enterprises.

IV.3. Labour Productivity

The evidence pertaining to production and value added per worker for different segments suggests that linkages do not necessarily lead to higher productivity. In fact, labour productivity is found to be significantly higher in the non-linked enterprises than in the linked ones both in the large and small sectors. The overall value of production per worker estimates to Rs.27,579 and value added per worker to Rs.11,367 in the small sector; the corresponding figures for the large sector are Rs.43,450 and Rs.22,587 respectively. In the small sector, production per worker is around 1.5 times higher and value added per worker almost twice in the non-linked as compared to the linked enterprises. Almost similar differences are found between linked and non-linked enterprises in large sector too (Table 11).

The relatively low productivity performance of the linked as compared to non-linked enterprises in the small sector may mainly be traced to the labour intensive nature of processes that are contracted out to them by large sector enterprises. To a certain extent it also reflects unfavourable terms of trade to them in their arrangements with the large enterprises. The large enterprises having arrangements for the supply of intermediate products from

Table 11

Productivity in Linked and Non-linked Enterprises

Sector	PRODUCTION PER WORKER (Rs.)			VALUE ADDED PER WORKER (Rs.)		
	Linked	Non-linked	Total	Linked	Non-linked	Total
Small	22727	31263	27579	7574	14247	11367
Large	38450	45014	43450	14720	26932	22587

the small enterprises generally reported that they do not have to pay higher than the market prices; and some of them admitted to be paying lower prices than what they would pay if purchases were made in the open market. While this may suggest an exploitative pattern of linkages, the productivity performance of the linked large enterprises does not reflect that they gained from this arrangement, as their productivity, both output and value added per worker, compares unfavourably with the non-linked enterprises in the same sector.

It may, however, be noted that the overall productivity differentials between linked and non-linked enterprises may be reflecting the effect of difference in the pattern of distribution of the two types of enterprises among various product groups, rather than actual disadvantaged position of the linked enterprises in similar lines of production. It is observed that the groups in which the extent of linkages is high are generally the ones which in any case show lower than average labour productivity.

For example, in the large sector the product groups casting and forging, metal furniture and fixtures, hand tools and general hardware and industrial machinery for other than food and textile industries have over 50 per cent of their enterprises linked, and all these groups show a markedly lower than average productivity. These product groups account for 23 out of 37 linked enterprises in the large sector. Similarly, in the small sector the product groups, metal cans, containers, boxes etc., furniture and fixtures, hand tools and general hardware, enamelling, japanning and polishing, machinery for industries other than food and textiles, miscellaneous general machinery items, motor vehicles and parts, and bicycles, tricycles and parts have a sizeable proportion of their enterprises linked, and show a generally depressed productivity level. The linked enterprises in these product groups add upto 65 out of 97 such enterprises in the small sector. On the other hand, existence of linkages is rather insignificant in product groups such as iron and steel, fabricated metal products and miscellaneous metal products in the large sector and structural metal products in the small, which show a generally high productivity level.

The lower average productivity of the linked enterprises, therefore, reflects, to a large extent, their unfavourable distribution among different product groups. As a matter of fact, if the linked enterprises were distributed among different product groups in the same manner as the non-linked ones, then average production

per worker in the linked enterprises would not be very much different from that of the non-linked ones. The output per worker estimated on this assumption would be Rs.45,014 for the linked enterprises as against Rs.43,450 for the non-linked ones in the large sector. On the same assumption the figure for the small sector linked enterprises is estimated at Rs.30,458 as compared to Rs.31,263 for the non-linked enterprises. Estimates of value added per worker on this basis turn out to Rs.19,441 for the large and Rs.14,528 for the small linked enterprises, as compared with Rs.26,932 and Rs.14,247 for the non-linked enterprises in the two sectors respectively.

Thus the productivity difference between the linked and non-linked enterprises in the small sector is almost entirely accounted for by the difference in the product group-wise distribution of the two types of enterprises. In the large sector, it accounts for 83.2 per cent of the observed difference. Linkages are, therefore, not associated with low productivity although they also do not lead to any marked productivity advantage.

V. SUMMARY AND CONCLUSION

Inter-sectoral market and technological linkages can serve as important elements in the process of industrial development by providing an assured market to small enterprises for their products and assured supply of intermediate products to the large ones ;by effecting a measure of division of labour and specialisation and providing

opportunities for capital saving and economies in research and development; and by bringing about a better technological integration among the two sectors through transfer of technology and skills from the large to the small enterprises. Neither the practice of linkages nor their expected effects can, however, be taken for granted : the first would depend on the nature of technological and market conditions of the industry concerned, while the latter would be a function of the extent, type, mode and pattern of linkages and entrepreneur's motivations underlying them.

Although the metal engineering industry is characterised by the necessary technological condition—multi-stage production—for inter-enterprise linkages, the main impulse for large enterprises entering into linkage arrangements with the small ones, is found to lie in the market conditions, a spurt in demand all of which could not be met by the large enterprises with the help of their installed capacity. Consequently, the predominant and central form of inter-sectoral relationship is found to be market linkages, sub-contracting of work by the large enterprises to the small ones, with or without supply of material, more often latter than the former. Further, since the type of work contracted out consists mainly of simple processes requiring little sophistication and skilled work, market linkages have not always been followed by technological linkages. But wherever technological linkages exist and they exist in case of around one-sixth

of enterprises, as against market linkages operating in about two-fourths of enterprises—they accompany market linkages in most cases, and exist independently only in a few cases.

Even in the limited number of cases where technological linkages are found, they do not involve any significant form of technology and know-how transfer. In many cases it either consists of purchase of some general second hand equipment of the large enterprises by the small ones or, more often, of specifications relating to size, shape and other characteristics of the product ordered by large enterprises from the small ones. Transfer of skills, mainly in the form of skilled workers of large enterprises leaving on their own to join the small enterprises, has taken place on a larger scale : it is significant to note that two-fifths of the small entrepreneurs are ex-employees of the large enterprises in similar lines of production.

Inter-sectoral linkages in the form of purposive and regular arrangements thus consist mainly of supply of the requirements of intermediate products of large enterprises by the small ones. The extent of linkages has varied significantly among different product groups : those having experienced a greater increase in demand for their products are found to have larger percentage of the enterprises practising sub-contracting. The small enterprises having market linkages with the large ones depend on this arrangement for the sale of around two-thirds of their product,

the large enterprises' dependence on them for intermediate products is also significant at around 40 per cent. The arrangement, by and large, is found working satisfactorily; sub-contractors supply the products on schedule; and rejections are few, probably because the work sub-contracted does not generally require high sophistication.

The fact that inter-sectoral linkages are a direct result of the inability of the large enterprises to cope with the spurt in demand with the help of their own plant, is further supported by the pattern of characteristics of the linked enterprises. In the large sector linked enterprises are generally older in age and smaller in size than the non-linked ones; the reverse pattern is revealed by the small sector enterprises. The older and smaller enterprises in the large sector have relatively old equipment with rather limited capacity, some of them lack some essential complement required to carry out complete process of production, and, therefore, they have to depend on the small enterprises for the supply of intermediate products increasingly. The old and small enterprises in the small sector, on the other hand, do not have the necessary capacity to deliver supplies to the large enterprises, and, therefore, the relatively new and bigger of them who have new, larger and also more modern equipment, are favoured as sub-contractors by the large enterprises.

Some of the substantially big enterprises in the large sector have also gone in for sub-contracting,

but they have sponsored a few small enterprises each for this purpose. They have provided assistance in the form of equipment and finance to them; and unlike the medium sized enterprises, these large enterprises sub-contract skilled and sophisticated processing also to their sponsored enterprises. As a consequence, some effective transfer of technology in the form of technical know-how takes place from the large to small enterprises in these cases.

Whereas the need for expanding output for meeting increasing demand emerges as the major factor motivating sub-contracting arrangements, question could be asked as to why the enterprises in the large sector prefer to sub-contract work to others rather than install additional capacity within their plants? A priori, one could postulate two propositions to explain this preference : one, that some of the enterprises are not in a position to make substantial investment required for the purpose; and two, given their profit maximising objective, they find it more economical to sub-contract. The empirical fact that more among the medium-sized enterprises in the large sector prefer sub-contracting; and that most of the sub-contracting enterprises admit that sub-contractors' cost is lower provide support to these hypotheses. There are, however, certain characteristics of the regulatory system and the market which have been indicated as the reasons for this preference by the linked enterprises in the large sector. Most important among them is the

increase in cost and degree of government control and inspection with increase in employment size beyond a limit, as a consequence of labour and fiscal legislation. Uneconomical nature of a permanent expansion in capacity is another reason in the case of enterprises producing goods with seasonal fluctuations in demand. Lack of physical space is another real constraint in expansion in a few cases. The relatively large enterprises have reached a production scale where additional output would cost them more than average and by sponsoring some sub-contractors they are able to prevent a rise in cost and still produce larger output to retain their share in the oligopolistic market in which most of them operate. By sponsoring their own sub-contractors they prevent the possible leakage of their special processes; and to some extent also reduce the incidence of corporate and other taxes which are directly related to the size of operations of the enterprise. Thus it looks that in most cases the linkages exist more as a measure of avoiding certain cost and other consequences of increase in size rather than as a positive response to an opportunity for maximising current return on investment. In other words, one could say, that the policy bias disfavouring largeness of size of private enterprises has tended to encourage inter-sectoral linkages.

Inter-sectoral linkages are found to have a consistent positive association with growth of output and employment : the linked enterprises have grown faster

than non-linked ones both in large and small sectors as well as in the individual product groups. True, it is the product groups experiencing faster increase in demand which have more often tended to go in for sub-contracting to meet the requirements of additional production but the availability of sub-contractors has enabled them to do. In the face of a general reluctance of the large enterprises to expand their own capacity, possibility of inter-sectoral linkages have helped fulfil their objective of increase in production, which has also led to increase in employment. While linkages are thus found to help in accelerating the pace of industrial growth in general, individual enterprises enterprises do not seem to have benefited in terms of an increase in efficiency of their resources and consequently in their profitability. Overall, the linked enterprises show a lower productivity of capital and labour. To a large extent it is explained by the fact that the linked enterprises are more often from the product groups in which the average level of productivity is low. But even within the individual product groups productivity of linked enterprises is not significantly higher than those of the linked ones. In a way this phenomenon reflects the fact that the linkage arrangements do not constitute a planned and positive step on the part of the enterprises to improve the efficiency of their resource use. Maximisation of output and sales with a view to maintaining or increasing their share in the market, while preventing rise in cost of production has been the main consideration for sub-contracting on the part of the

large enterprises. The small linked enterprises derive the protection of an assured demand for their products, without any loss of efficiency and return on their investment.

It can be argued that a positive approach to inter-sectoral linkages by way of simultaneous planning of capacity creation in the large and the small sector for mutually complementary processes, could help in improving the efficiency of resource use along with acceleration of growth of output and employment. That the large enterprises do not want to expand their capacity and employment beyond a size should provide a favourable condition for such an effort. So far, inter-sectoral linkages have mainly been of a mere 'gap-filling' character, to the extent they comprise sub-contracting such work to small enterprises which the large enterprises need but cannot perform themselves.

As a step towards at least disseminating information on small enterprises' capacity to take work on sub-contract from the large ones, Government of India have recently set up a Sub-contracting Exchange under Small Industries Service Institute (SISI) at Kanpur. Small units using sophisticated technology and experiencing underutilisation of capacity may get themselves registered with this Exchange. The Exchange brings the information supplied by the registered small units in regard to the nature of processing that they can undertake to the notice of the large firms which have an

investment of Rs.50 lakhs or more on plant and equipment. The authorities at the Exchange, however, do not report any success under this Scheme. During last one year of its functioning only 40 small units have been registered with the Exchange and although there is no systematic feedback, the authorities report that large units have not used the information for contracting out work to the registered small units. However, in the manner in which it has been conceived the Exchange does not aim at preventing unplanned capacity creation and improving the efficiency of resource use. It has only the limited objective of overcoming the obstacles to the flow of information regarding underutilised capacity with the small units.

An effective programme of inter-sectoral linkages would involve (i) identification of processes and products which could be undertaken and produced equally or more efficiently in the small units; (ii) anticipated growth in demand of these processes and products; (iii) specification of appropriate technology which could be used by small units to satisfy efficiency criteria; and (iv) reservation for small units in these processes and final product and intermediate product lines. In order that such reservation could be more effectively used for the purpose it should be followed up by a programme of ancillarisation. Public policy and intervention should thus aim at not merely banning large units to come up in certain production lines, but also for creating possi-

bilities for the smaller units to effectively make use of reservation.

The programme of inter-sectoral linkages suggested above may still leave the very small of the small sector enterprises out of its fold because of low levels of technology and efficiency among them. Linking them up technologically and market-wise with large modern enterprises may help improve their technology and efficiency levels, but the large enterprises would not be willing to sub-contract work to them in the first instance. The public programme of technological and marketing help alone could, therefore, improve their situation. But, linkage arrangements with large enterprises, even when entered into, may turn them into a position of dependency, thus encouraging unfavourable and exploitative terms of trade which would rob them of any advantage they may derive from linkages. Therefore, any assistance rendered to them to improve their efficiency could be effective only when they are also simultaneously organised at least for the purposes of marketing of their products and for undertaking work sub-contracted by large enterprises.

Annexure - 1

Universe and Sample

Product Group	Description	Large Sector		Small Sector		Total	
		Universe- rse	Sample	Universe- rse	Sample	Universe- rse	Sample
1	2	3	4	5	6	7	8
330	Iron and Steel Industries	3 (1.65)	3 (2.82)	0	0	3	3
331	Foundries for casting and forging iron and steel	45 (24.75)	17 (15.98)	54 (10.80)	9 (3.78)	99	26
332	Manufacture of ferro-alloys	1 (0.55)	0	3 (0.60)	0	4	0
335	Aluminium manufacturing	2 (1.10)	2 (1.88)	0	0	2	2
340	Manufacture of fabricated metal products such as metal cans from tin-plate, enamelled sheet metal, metal shipping, containers, barrels, drums, kegs, safes, vaults, enamelled sanitary and all other fabricated metal products not elsewhere classified	16 (8.80)	12 (13.16)	46 (9.20)	13 (5.46)	62	25
341	Manufacture of structural metal products	2 (1.10)	1 (0.94)	15 (3.00)	10 (4.20)	17	11
342	Manufacture of furniture and fixtures primarily of metal	3 (1.65)	3 (2.82)	8 (1.60)	6 (2.52)	11	9
343	Manufacture of hand tools and general hardware	21 (11.55)	10 (9.40)	128 (25.60)	47 (19.74)	149	57
344	Enamelling, japanning, lacquering, plating and polishing of metal products	3 (1.65)	3 (2.82)	25 (5.00)	16 (6.72)	28	19
345	Manufacture of metal utensils, cutlery and kitchen-ware	16 (8.80)	12 (11.28)	5 (1.00)	4 (1.68)	21	16

1	2	3	4	5	6	7	8
349	Manufacture of metal products except machinery and transport equipment not elsewhere classified like type-founding	8 (4.40)	8 (7.52)	11 (2.20)	10 (4.20)	19	18
350	Manufacture of agricultural machinery and equipments and parts	14 (7.70)	9 (8.46)	11 (2.20)	10 (4.20)	25	19
351	Manufacture and repair of drills, coal cutting machines, earth moving, lifting and hoisting machinery, cranes, conveyors and road rollers and other heavy machinery and equipments used by construction and mining industries	0	0	2 (0.40)	0	2	0
352	Manufacture of prime movers, boilers and steam generating plants such as diesel engines and parts	1 (0.55)	0 (0.20)	1 (0.20)	1 (0.42)	2	1
353	Industrial machinery for food and textile industries	4 (2.20)	2 (1.88)	10 (2.00)	4 (1.68)	14	6
354	Industrial machinery for other than food and textile industries	5 (2.75)	3 (2.82)	28 (5.60)	8 (3.36)	33	11
355	Manufacture of refrigerators, air conditioners and fire fighting equipment and other parts, components and accessories	1 (0.55)	0 (0.40)	2 (0.40)	0	3	0
356	Manufacture, alteration and repair of general items of non-electrical machinery, components, equipments and accessories not elsewhere classified, e.g. manufacture and repair of size reduction equipment like pentagraph, monograph etc. crushers, conveyors, bucket elevators, ship hoist cranes, derricks etc., power driven pumps etc., air, gas compressors and vacuum pumps (excluding electrical furnaces)	0	0	3 (0.60)	3 (1.26)	3	3
357	Manufacture of machine tools, their parts and accessories	1 (0.55)	1 (0.94)	16 (3.20)	16 (6.72)	17	17
358	Manufacture of office computing and accounting machinery and parts	0	0	1 (0.20)	0	1	0

1	2	3	4	5	6	7	8
359	Manufacture and repair of non-electrical machinery and equipment, components and accessories not elsewhere classified such as sewing machines automatic mechanising machines, washing, laundry, dry-cleaning and pressing machines, cooking ranges and ovens, other service industry machines, arms and armaments etc.	15 (8.25)	9 (8.46)	65 (13.00)	53 (22.26)	80	62
361	Manufacture of insulated wires and cables	1 (0.55)	1 (0.94)	0	0	1	1
372	Manufacture of railway wagons and coaches and parts	1 (0.55)	0	0	0	1	0
374	Manufacture of motor vehicles and parts	7 (3.85)	0	24 (4.80)	13 (5.46)	31	13
376	Manufacture of bicycle, cycle rickshaw and parts	9 (4.95)	8 (7.52)	14 (2.80)	8 (3.36)	23	16
379	Manufacture of transport equipment and parts not elsewhere classified	0	0	4 (0.80)	1 (0.42)	4	1
380	Manufacture of medical, surgical and scientific equipments	2 (1.10)	0	2 (0.40)	0	4	0
381	Manufacture of photographic and optical goods (excluding photo chemicals, sensitised paper and film)	0	0	1 (0.20)	0	1	0
387	Manufacture of miscellaneous metal goods	0	0	11 (2.20)	3 (1.26)	11	3
392	Repair of motor vehicles and motor cycles	0	0	19 (3.80)	2 (0.84)	19	2
TOTAL		181 (100.00)	104 (100.00)	509 (100.00)	237 (100.00)	690	341

Note: Figures within brackets show percentages.

Annexure - 2

Types of Linkages

Product Group	Large Sector				Small Sector				Sector				Total
	Technol- Linkage	Market Linkage	Technol- Linkage	Technol- & Market Linkage	Non-Lin- kage	Total	Technol- Linkage	Market Linkage	Technol- & Market Linkage	Total Linkage	Non-Lin- kage	Total Linkage	
1	2	3	4	5	6	7	8	9	10	11	12	13	
330	0	0	0	0	0	0	0	0	0	0	0	0	0
331	0	0	0	0	0	0	0	0	0	0	0	0	0
335	0	0	0	0	0	0	0	0	0	0	0	0	0
340	0	0	0	0	0	0	0	0	0	0	0	0	0
341	0	0	0	0	0	0	0	0	0	0	0	0	0
342	0	0	0	0	0	0	0	0	0	0	0	0	0
343	0	0	0	0	0	0	0	0	0	0	0	0	0
344	0	0	0	0	0	0	0	0	0	0	0	0	0
345	0	0	0	0	0	0	0	0	0	0	0	0	0
349	0	0	0	0	0	0	0	0	0	0	0	0	0
350	0	0	0	0	0	0	0	0	0	0	0	0	0
352	0	0	0	0	0	0	0	0	0	0	0	0	0
353	0	0	0	0	0	0	0	0	0	0	0	0	0
354	0	0	0	0	0	0	0	0	0	0	0	0	0
356	0	0	0	0	0	0	0	0	0	0	0	0	0
357	0	0	0	0	0	0	0	0	0	0	0	0	0
359	0	0	0	0	0	0	0	0	0	0	0	0	0
361	0	0	0	0	0	0	0	0	0	0	0	0	0
374	0	0	0	0	0	0	0	0	0	0	0	0	0
376	0	0	0	0	0	0	0	0	0	0	0	0	0
379	0	0	0	0	0	0	0	0	0	0	0	0	0
387	0	0	0	0	0	0	0	0	0	0	0	0	0
392	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	20	17	37	67	104	6	58	33	97	140	237	